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Wild interdisciplinarity: ethnography and computer science

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ABSTRACT

Drawing on the experiences of a novel collaborative project between sociologists and computer scientists, this paper identifies a set of challenges for fieldwork that are generated by this *wild interdisciplinarity*. *Public Access Wi-Fi Service* was a project funded by an ‘in-the-wild’ research programme, involving the study of digital technologies within a marginalised community, with the goal of addressing digital exclusion. We argue that similar forms of research, in which social scientists are involved in the deployment of experimental technologies within real world settings, are becoming increasingly prevalent. The fieldwork for the project was highly problematic, with the result that few users of the system were successfully enrolled. We analyse why this was the case, identifying three sets of issues which emerge in the juxtaposition of interdisciplinary collaboration and wild setting. We conclude with a set of recommendations for projects involving technologists and social scientists.

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1. Introduction

Digital systems are becoming ever more integrated into the fabric of our social worlds; as sites of social interaction, repositories of vast accumulations of activity traces, and catalysts for new configurations of practices. As they do so, the need for social science to engage with them – both as objects of study and tools in the support of study – becomes ever more pressing. The nascent field of digital sociology (e.g. Lupton, 2015; Orton-Johnson & Prior, 2013) has already come to be associated primarily with ‘big data’, in the form of quantitative analyses of very large datasets generated by digital systems (e.g. Boyd & Crawford, 2012; Edwards, Housley, Williams, Sloan, & Williams, 2013). In this paper we address digital sociology in a different guise, as applied ‘small data’ collaborations with digital technologists. Our concern is with the implications of this new form for the *doing* of social science fieldwork, drawing on a case study of a project called *Public Access Wi-Fi Service* (PAWS).

We refer to this new form as *wild interdisciplinarity*, in recognition of the two defining characteristics of it. Although calls for interdisciplinarity have a long history, it is only recently that it has become a central feature of research funding, and is now on the agenda of all UK research councils (Spiller et al., 2015; Strathern, 2004, p. 69), not least as a means of fostering innovation (Barry, Born, & Weszkalnys,

2008) in addressing ‘grand challenges’ (Fitzgerald, 2013, p. 3). As Mills and Ratcliffe (2012) note, calls for interdisciplinarity are part of a push for research in the *knowledge economy*, where there is a shift from ‘pure’ research to applied research emphasising social and economic contributions. They can be seen as part of the wider trend in shifting from Mode 1 to Mode 2 research (Gibbons et al., 1994). Some have critiqued this new form of research (e.g. Strathern, 2000). In this paper, our focus is on the practical consequences.

The emphasis placed on social and economic impact has meant that social scientists are being built into technological and engineering projects¹, in order to provide ‘access to difficult-to-reach communities, accessing day-to-day life, voicing marginal or silenced perspectives’ (Mills & Ratcliffe, 2012, p. 15). In short, to provide access to the ‘real world’. The funding behind this turn is impetus enough to engage with it, but much more than that, here lies an opportunity for social scientists interested in understanding processes of social change, and the apparatus brought to bear in the hope of shaping that change.

As a collaboration between computer scientists and sociologists, PAWS was a project very much of this mode. The goal was to address the ‘real world problem’ of digital exclusion. PAWS sought to remove the primary financial barrier to Internet access for households – the monthly bill. This was to be achieved by convincing existing broadband customers (‘Sharers’) in a community to make a small amount of their connection available to PAWS to share through a secure platform. ‘Citizens’ could, having registered with us, then connect to the Internet through any Sharers in the local vicinity via a PAWS Wi-Fi signal. The technical interests in the project revolved around the performance of the system, and the acceptability of it to the public. The social science interest focused on interplays of existing community and the sharing of this new, invisible resource, as well as on the impacts Internet access had on the lives of the previously digitally-excluded.

Pursuing these goals required a move out of the lab, into the ‘wild’ of real-world settings. PAWS was funded through the UK’s Engineering and Physical Science Research Council (EPSRC), as part of a programme entitled ‘Research In-the-Wild’, which called for applied research engaged with ‘real problems’ (Engineering and Physical Sciences Research Council [EPSRC], 2012, p. 2), resulting in measureable output beyond the traditional academic forms (i.e. peer-reviewed publications):

‘Research in the Wild’ is about enabling researchers [...] to expose and test their research ideas with potential beneficiaries – for example, the individual, business and/or society – in order to get closer to achieving a viable proposition with potential for transformational impact. (EPSRC, *ibid.*)

To meet these requirements, PAWS included a number of elements: it tackled a phenomenon considered a socio-economic problem; its proposal was to be evaluated in a non-academic, ‘wild’² setting; its solution required an interdisciplinary programme to achieve; and technologies played a prominent role. Novel technologies are an integral part of the push towards interdisciplinary research, indeed so much of what is discussed as inter- or multi-disciplinary work involves technology-focused collaboration between social and technical or life science disciplines (e.g. Barry et al., 2008; Prainsack, Svendsen, Koch, & Ehrich, 2010) that it is easy to mistake them as being one and the same. Whilst this work does not *have* to be conducted in the wild, we argue that, for the reasons set out above, they emerge out of the same funding framework and so are liable to co-occur with enough regularity that it is productive to analyse their combined impact on the work of conducting a project. This is the approach we take here.

In what follows we draw on our experience of carrying out the PAWS fieldwork to identify three challenges that emerge in wild interdisciplinarity. These challenges undermined the PAWS fieldwork, to the degree that it is questionable whether PAWS could be said to have achieved its original goals. In that sense, what follows can be read as an ‘anatomy of a failure’ (Gaver et al., 2009).

One of the successes that *can* be drawn from PAWS lies in correcting our mistaken belief that it was simply an extension of a well-established form of research. Social science has a long history in computer science (CS) – see, for example, Sommerville, Rodden, Sawyer, and Bentley (1992) *Sociologists can be Surprisingly Useful in Interactive Systems Design*. This history can be found in the sub-disciplines of

Table 1. Recruitment in numbers.

Doors knocked	~2158
Recorded responses (i.e. door answered)	730
Potential sharers	98 (13.4% of responses)
Potential citizens	36 (4.9% of responses)
Sharers (i.e. PAWS installed)	21(+1 hub ^a)
Potential pairs ^b	17
Realised pairs	2

^a'Hub' refers to a public space with a PAWS box fitted (see Section 3.1.2).

^b'Pairs' refers to a sharer and a citizen living sufficiently close that the latter could connect to the former's PAWS box from their own home. This is discussed in more detail in the following sections.

Human-Computer Interaction (HCI) and Computer-Supported Cooperative Work (CSCW). The ethnographic approach which the sociologists in PAWS were to take is well established in both. However, in this paper we show how social and technical science collaborations in wild interdisciplinarity are very different from those in HCI and CSCW, and highlight the implications of this for fieldwork. We conclude with a set of recommendations that social scientists might adopt to counter the dangers PAWS found itself facing in its journey into the wild.

2. The project

PAWS began from the belief that the Internet is now sufficiently integral to participation in society that it must be available to all Citizens, indeed it could be considered a human right (La Rue, 2011). To such ends, the 'grand vision' underpinning PAWS was of a *national Internet service*, in which all routers deployed by Internet Service Providers (ISPs) by default share a fraction of the connection's capacity as a Wi-Fi signal that anyone else registered on the service can use. A proof of concept, PAWS aimed to address the 'material access' side of the digital divide, instead of other factors such as skills or motivations (van Dijk, 2005; Warschauer, 2003). Using Horrigan's (2011) terminology, PAWS was aimed at the 'digital hopefuls' and the 'near converts' (those who like being online, but are deterred by cost or lack of skills) – not the 'digitally distant' or 'digitally uncomfortable' (those who have negative attitudes toward cyberspace, as well as a lack of resources and skills).

PAWS was to be trialled 'in the wild' over a three month period in a socio-economically marginalised community called Aspley, in Nottingham, chosen for its low levels of Internet take up (~72% compared to ~92% in the wealthier neighbouring borough [Nottingham City Council, 2012]). The research group consisted of two disciplinary teams. The computer scientists were tasked with building the platform itself, with design input from the sociologists (the first two authors of this paper), who were in turn to run the fieldwork with technical support from the computer scientists. The fieldwork was to involve the recruitment of ~50 Sharers, who would host a PAWS box³ in their home, and ~50 Citizens whose experiences with the system would form the bulk of the research. This target was knowingly ambitious – we would have been well satisfied with half as many Citizens – but what we did not know was quite *how* ambitious it was.

Preparations for the fieldwork began in early 2013, with active recruitment taking place from May onwards, for a start date of summer 2013. Our first, largely fruitless, efforts during preparation were directed towards the enrolment of existing community actors, in the hope that they would support subsequent efforts. Those efforts were door-to-door recruitment by ourselves. Despite some successes, this also failed to illicit the required participants. So in a third stage of recruitment, we enlisted a team of students to do the door knocking whilst we directed their efforts. Simultaneously we sought participants through a 'self-signup' route – that is, anyone connecting to a PAWS Wi-Fi signal could apply for an account.

Despite all these efforts – which dwarfed those required for any previous recruitment work we had conducted – the recruitment stage could only be considered a failure, if judged by the number of Citizens using the service (see Table 1).

We knocked on just over 2000 doors and in 730 cases were able to speak to someone. We were able to interest 98 potential Sharers and 36 potential Citizens. In the end, we installed a PAWS router in 21 homes and 1 in a Community Centre. This number could have been much higher but efforts were increasingly directed towards Citizens, specifically, those *close enough to 'pair' with a sharer to receive a wireless signal*. Ultimately this was where recruitment failed, with the result that PAWS only had two citizen users during the trial. As a result the project did not succeed in evaluating the PAWS platform in the manner originally intended, though the difficulties encountered provided a different form of evaluation, and a series of unanticipated insights into the nature of this form of disciplinary collaboration.

In the rest of the paper we draw on these experiences, to report on how the challenges of fieldwork in such an interdisciplinary project led to that stage's failure, and set out measures so that others might avoid such an outcome in future work. We believe that PAWS was an early foray into a domain of research that will become increasingly common for sociologists, and social scientists more generally.

3. Interdisciplinarity in the wild

It is our argument that interdisciplinarity 'in the wild' poses a unique set of challenges for social scientists. In what follows we draw on experiences of the PAWS fieldwork to identify and unpack three of them: problems of time, digital plumbing, and going native.

3.1. Problems of time

The source of many of the tensions which hampered the PAWS fieldwork ultimately lay in the unforeseen time demands involved. Ethnography, in sociology and particularly in anthropology, has traditionally been practiced as an extended process, stretching over months or even years. By comparison, systems design in applied CS proceeds very rapidly indeed (Crabtree et al., 2012). The long standing, productive relationship between CS and both HCI and CSCW is founded on the understanding that this is a *service* relationship, in which the latter two adjust their methodological cadences to suit the system designers: 'No designer in their right mind is going to sit around and wait for the results of a long-term ethnography to appear before they get on with building a system' (ibid. p77). The 'quick and dirty' nature of design-supporting ethnography is a response to this problem. The arrangement is viable because the purpose of ethnography here is to provide an overview of one aspect of the setting relevant to the proposed system to be introduced. It is not to detail the setting in its minutia.

The wild setting itself carried consequences in this regard. This was not the 'tame' setting common in HCI and CSCW, almost invariably limited in scale – as in the air traffic control room studied by Sommerville et al. (1992) – and populated overwhelmingly by white collar, educated, middle-class Caucasians – which is to say, people like the researchers themselves (cf. Henrich, Heine, & Norenzayan, 2010). This was different, both in scale and in social distance from the research team. It was, in fact, much more like the settings studied by sociology.

The relationship between CS and sociology in PAWS was one of *collaboration*, the goal less systems design than the application of systems design to a societal challenge. The role of the sociologists was to inform the evaluation of the system, but only as part of an evaluation of the phenomenon of digital exclusion and the project's efforts to address it. This relationship was recognised in the project plan, which at 18 months duration, with a 3 month deployment in the middle, appeared sufficient for the research needs of the sociologists to be met.

Experience proved otherwise. The project timeline might have proved sufficient for a sociological study of digital exclusion, and certainly would have been sufficient for a CS-led system design study. Studying in-the-wild proved to be *slow* however, *too slow* within the constraints of the project's funding. The consequence of the unanticipated demands described below was that time which should have been spent conducting research was instead expended on recruitment. In 3.1.1 we detail how

the collaborative nature of wild interdisciplinarity contributed to this problem. In 3.1.2 we describe how features of the setting itself were problematic.

3.1.1. *Collaborators' demands on recruitment*

As qualitative researchers, the sociologists' inclination was a limited sample size, to be studied in depth. However, the PAWS sample size was determined by the technical logics of the question being asked. From this perspective, the project's fundamental requirement was to provide a proof of concept of a national-scale infrastructure. The target of 100 participants was chosen in order to simulate, to a degree, some of the scale effects that would be present in a national scheme, in particular, high density of coverage. Due to the short range of Wi-Fi signals (claimed by industry promotions to be 25–200 m depending on obstructions), even a small community would need multiple transmitters (Sharer's PAWS routers) to ensure reasonable coverage.

Furthermore, this restriction required that the sample be drawn from a spatially constrained population. Whilst quantitative social science may regularly recruit larger samples than PAWS sought, it is likely to be from a relatively unbounded population: UK Citizens who have used the National Health Service in the past 12 months; Facebook users aged 18–30, etcetera. To achieve some density of coverage for PAWS' network, the team selected a single council estate, containing approximately 2200 houses.

It was the challenges of recruiting from such a limited population that required the time-intensive recruiting strategies the team pursued. In practice however, even this spatial bounding proved insufficient to overcome the limitations of Wi-Fi: the limited area was still too large to get anything like comprehensive coverage of. It had been assumed from the outset that a Citizen without a Sharer within Wi-Fi range of their home was unlikely to find much utility in the system, and so recruitment became primarily concerned with the spatial relationship between individual Sharers' and Citizens' houses. In other words, identifying 'pairs' of participants. Ordering the recruitment process became a complex logistical operation which greatly added to the time demands of the fieldwork.

Results from the door-knocking work was entered into a spreadsheet, which could then be read by mapping tools in order to visualise the process of pair identification. In this way we sought to rationalise the management of the spatial element, escaping the street level view of the recruiting team in order to adopt a God's eye view. We first turned to *Google Fusion*, a free tool that makes use of Google's well established mapping software. The wild rebuffed this effort. After feeding our data tables into *Fusion* we were presented with a map of Aspley that rendered our Sharers and Citizens as a small number of amalgamated blobs, as if in its keenness to support our goal of digital inclusion, Google had relocated all our potential pairs atop one another in a great heap. The more prosaic explanation was that, for all its seeming omnipotence, *Google Maps* was a god that knew less than it let on. Critically, it did not *know* the location of house numbers, it simply had an algorithm that placed house numbers relative to the start and end points of a street. Whilst effective on an American grid pattern, this solution was defeated by Aspley's elliptical garden city lines. Google might have been able to serve up satellite imagery of the Sahara, or the topography of the Pacific Ocean floor, but it did not know where 190 Minver Crescent was.

Eventually a solution was found, an Ordinance Survey programme that individually numbered every house in the borough. The recruitment data was collated, fed in, a number of pairs were identified, and it appeared as though, with the investment of enough resources, the wild had been conquered. The map is not the territory however. Identifying 'potential pairs' on a street plan proved easier than realising them in the wild, as subsequent sections will attest.

3.1.2. *Recruiting the excluded*

Whilst the target of one hundred participants was recognised as a challenge, it was considered one only quantitatively different from the small-scale technology evaluations common in HCI/CSCW. What became apparent as the project struggled was that it was *qualitatively* different due to the nature of the wild. The requirement of 'in the wild' to address a recognised social problem necessitates engaging with that problem during the research trial, and yet social problems do not exist in isolation. The

digital exclusion we sought in Aspley was intertwined with larger structures of exclusion, social and economic (van Dijk, 2005, p. 178; HM Government, 2008, p. 9). Such exclusion left its marks on both the social structures of the estate, and the accessibility of those that would constitute PAWS' Citizens. The problem we sought to grapple with was enmeshed within a whole set of problems which greatly slowed down recruitment.

Our hope from the outset was to support recruitment by accessing existing community networks. It became apparent however that there was little trace of what might traditionally be recognised as community within Aspley, nor the spaces that might support it. Early on the research team identified the local residents' association as a potential aid to recruitment. We attended one of the association's 'monthly' meetings (it was the first to take place in 6 months). We gathered in a small back office at the local community centre, where the three locals who attended responded to our pitch with a mixture of disinterest and mild bafflement. The experience dissuaded us from proceeding any further down this path.

The community centre itself, located at the heart of the estate, was more promising. A planned development built during the interwar years, Aspley is a council estate laid out in a pattern of concentric rings that close in on a central point. Typical of the period, such designs sought to reconcile the open spaces and sweeping curves of the garden city ideal, with the economic and political constraints of the time (Aston & Bond, 1976, pp. 205–207). This form did maximise access to the shared facilities in the centre of the rings, but as these consisted solely of a primary school and the community centre, the design seemed more likely to emphasise the estate's poor provision of social infrastructure, and isolate it from the wider area. The paucity of public, cultural and commercial spaces within Aspley is common of a period in which planners were tasked with building houses, not 'worry[ing] about the social consequences' (Meller, 1997, p. 60). Nevertheless, its centrality meant that the community centre was perfectly positioned to act as a recruiting space. The centre put on a number of classes, and even had its own broadband connection to serve a computer suite on site, a facility that was only open to the public during specific evening classes. In exchange for supporting the cost of this broadband for the three months of deployment, the centre's staff agreed to promote the project and allow us to install a PAWS box, making the site into what we referred to as a 'hub'.

This was the sole oasis in a civic desert. Our interactions with the local church on the edge of the estate suggested it was poorly attended. Across the entire estate there was not a single pub, coffee shop, restaurant or bar which might support social life. In terms of commercial premises, places to meet were limited to the serving counters of takeaways, the aisles of the convenience stores, or the hairdressers. In the absence of alternatives, the potential of the latter locations for sites of community – as a place where people might *stop* – were realised too late to be made use of.

Our community engagement did lead to the identification of two individuals who were well connected. These were a local councillor and a council-employed 'Neighbourhood Development Officer'. Both had deep knowledge of the estate and contact with many inhabitants, and were highly positive in respect of the project's goals. They had their own 'real problems' to grapple with in Aspley however, and the demands on their time meant that whilst they proved useful sources of information, they could provide little in the way of direct support.

Aspley was far from being simply an expansion of a typical HCI study site: a white collar office, a museum; a house occupied by students or a middle-class family. This was a setting in which the researchers were aliens, and access could not be established through networks of personal or professional contacts. The time required to traverse this social distance compounded the delays introduced by the technology's sample requirements.

3.2. The work of digital plumbing

The second feature of wild interdisciplinarity we wish to highlight is the work that falls into the gaps between disciplines. This work we characterise as 'digital plumbing' (Tolmie et al., 2010). This is the overlooked, mundane yet vital work of deploying technologies in a research setting. Successfully

recruiting any one participant, be they Sharer or Citizen, required equally the cooperation of non-humans, in forms such as Wi-Fi signals, smartphone operating systems and home router firewalls. However, far from being simply technical labour, digital plumbing is a matter of siting the technology within the existing social *and* technical apparatus of the home. As the fieldwork team, it fell to the sociologists to conduct this work. In this section we provide an example of the kinds of demands this work placed on the fieldworkers (3.1.2), and how elements of it evaded the expertise of all on the project, with major consequences for the study (3.2.2).

3.2.1. Technical and emotional labour

Technologies do not emerge *sui generis*, but rather emerge out of existing standards, protocols, and affordances (Star, 1999). By building on these elements, new technologies are reliant upon them. In the case of PAWS, the system depended upon a swathe of communication technologies which were beyond the team's control.

Setting up Citizens to use PAWS involved a somewhat tortuous process, a result of the Virtual Private Network (VPN) protocol which PAWS used to ensure security. For a device to connect to PAWS required a VPN correctly configured for the particular hardware on which it was running, and these devices were constantly changing. In amongst the endless churn of the consumer electronics business, devices and the operating systems running on them are subjected to constant revision. Furthermore VPNs are intended primarily for corporate users rather than consumers. As a result, setting up VPNs on Citizens' devices was often an arduous process (Windows 7 for example required a sequence of *thirty-one* actions), as well as one unique to that particularly operating system revision. We would like to think of ourselves as reasonably technology literate – at least by the standards of sociologists – and yet this profusion of processes added considerably to the difficulties of fieldwork. The project team tried to manage this problem by creating a checklist for each of the seven operating systems that PAWS was designed to work on. This did allow us to negotiate the process of VPN setup with reasonable success, but there were always cases where the technology still refused to participate, and our only option was to retreat back to the expertise at the CS department in search of a solution.

Even where the technology was obliging, the demands of parleying with it, whilst at the same time navigating the equally important task of interacting with the human participant (Thomas et al. 2007), was a fraught task. Peneff (1988, p. 527) speaks of the means by which fieldworkers 'cope' with the many ambiguities and tensions of fieldwork, in a setting in which they must execute a formalised task in manner naturalistic enough that the human participant might engage as if it was a conversation with a trusted acquaintance. Trying to figure out why a tablet was refusing to connect to PAWS – instead complaining of an 'Out of date security certificate' – whilst simultaneously presenting the required attention and sympathy towards a participant met five minutes earlier, who was now relating her recent ordeal at the local hospital following a heart scare, it was difficult for us not to look on Peneff's fieldworkers with envy. This simultaneous performance of emotional and technical labour, orientating to both human and non-human, is a challenge particular to this form of fieldwork.

3.2.2. Gaps in coverage

Wi-Fi was the key technology underpinning PAWS, yet its utility could be seen as an accident of design. As a consumer technology, home routers using Wi-Fi are intended to allow a household, as the contractual partner to an ISP, to connect to the Internet anywhere in their home, without the encumbrance of wires. For a Wi-Fi signal however there is nothing to differentiate an internal wall from an external or perimeter wall. It was this unintentional capacity to pass through the outer walls of homes and beyond the plot's boundaries which created the possibility of PAWS.

The accidental nature of this affordance was reflected in how precarious the signal was once beyond the originating home. We had been reassured during the planning stages by the computer scientists' faith in the viability of the project, and as social scientists assumed that if the technical team were happy then there was little to worry about. This though was a problem of interdisciplinarity. We failed to understand the expertise of the technical team. Only when things were going wrong did we fully

appreciate that these were not ‘techies’ knowledgeable of all ‘techy’ issues, rather they were computer scientists whose expertise was in software. Wi-Fi range is an issue which falls between disciplinary gaps. In the words of one of the team’s computer scientists (see also Kotz et al., 2004):

Radio physicists know what the answer is in theory; the lab engineers know what the answer is by simulation; computer scientists don’t care what the range is, they care what the throughput or latency is.

This epiphany came too late. Contrary to claimed Wi-Fi ranges of up to 200 m, our experience of the wild was that any Sharer-Citizen pair that was not directly next door to one another was unlikely to be viable. In fact, even that principle did not always apply: on occasion, a Citizen was unable to receive a signal from a Sharer next door, due to the particular placement of the PAWS box relative to obstructions. On the other hand, we had an instance where someone was able to get a signal almost one hundred metres away, simply because there were no obstructions blocking the signal.

In the grand vision, where all routers were PAWS enabled, short range would not be too great a problem in densely-occupied urban areas. In our simulation though, the limitations of Wi-Fi meant we had to recruit far more than we needed on paper, in order to find the few that could become pairs. This unexpected demand added hugely to the fieldwork schedule.

3.3. *The dangers of going native*

For some strains of ethnography, ‘going native’ – becoming encultured in the research setting to such a degree that ‘critical distance’ is lost – is a very real danger which must be guarded against. Going native became problematic for the PAWS sociologists in a different sense. In hindsight, our framing of both the research and the setting became captured not by the members of the setting, but by the technologists on the project team. PAWS was always, fundamentally, a technology project. Regardless of how beguiling its vision of community-sourced solutions to exclusion might be, and its efforts to address the challenge in an interdisciplinary manner, it ultimately turned on the application of a top-down technological solution to a social problem. This section discusses two consequences that stemmed from the sociologists – won over by the techno-idealism at the heart of the project – losing critical distance. In 3.3.1 this leads to an imagined set of research participants who did not exist in practice. 3.3.2 highlights how the sociological research became a hostage to the technology’s fortunes.

3.3.1. *The technologically constituted participant*

During project planning, the greatest concern amongst the project team was that PAWS might fail to find enough residents willing to act as Sharers. It was easy to adopt the computer scientists’ concerns that the notion of sharing a resource with strangers would be rejected by many, or that security fears might prove insurmountable. Citizens were less of a concern: it was thought that the combination of free access to the Internet and a £50 voucher would be sufficiently compelling for those with limited resources. As Table 1 shows, there were in fact more than enough civic-minded Aspley residents to meet the sharer target. Against expectations, the problem was Citizens.

In hindsight it became clear that in buying into PAWS’ technological programme we had been insufficiently sensitive to the social orientations of those we were seeking out. We were appraising the project through the eyes of the technologists not the members of the setting (Ellsworth-Krebs, Reid, & Hunter, 2015). Citizens were liable to be amongst the most marginalised of a marginalised community. The implications of this for the door-to-door recruitment we conducted are made clear in McKenzie’s (McKenzie, 2015) recent ethnography of life on estates like Aspley (actually conducted on another Nottingham estate just 3 miles away). She writes

it was actually very impolite to turn up unannounced. This practice was always about risk management – there was a lot of fear and suspicion on the estate, fear of the unannounced visitor, which meant the police, the ‘social’, the TV licensing people. It always meant problems, and doors would not be opened if they didn’t know who was on the other side of it.’ (p. 89)

Men particularly were liable to seek to ‘stay off “the system”’, incentivised to do so by various institutional concerns. If they had a partner also in social housing, being seen at their address could lead to them being classed as a couple and told to live together, the man’s tenancy taken away. For others in the criminal economy, ambiguity about where they lived made it harder for the police to gain warrants should they wish to launch a raid. Our experience of going door-to-door seemed to support McKenzie’s account: Citizens were hard to find, particularly men, and many properties never answered the door (see Table 1), despite knocking on more than one occasion, and often when it was clear someone was home.

Even having successfully made contact, difficult work remained to bridge the gulf between the technologists’ framings and those amongst the digitally excluded. Technologies, and the services carried by them, require both knowledge and embodied skills to negotiate. The Internet, and the devices, cables, aerials and signals which deliver it to the user, are no exception (van Dijk, 2005; Warschauer, 2003). For many of the digitally excluded, the lack of relevant knowledge and skills was a major impediment to adoption, and by extension to participation in PAWS. The project had no resources to acclimatise those who were strangers to this world, and so Citizens could only be those who had already accrued them, or whose desire to be online was sufficient to overcome the discomfort of adaptation. We found though, as the literature forewarned (Horrigan, 2011), that a sizeable percentage of Aspley’s digitally excluded – perhaps half – were either content to be so, or even actively defensive of this status. In the words of one ‘digitally distant’:

R[recruiter]: Would you like to have the Internet?

Man: No, that’s alright. I’m not interested.

R: May I ask why not?

Man: Cos it’s a load of fucking bollocks.

If a gambit existed which might recover a participant from such an interaction, the fieldworkers did not find it.

It is not a novel experience for those conducting longitudinal sociological research to find both recruitment and retention difficult, particularly when the target group are socially marginalised. PAWS certainly experienced this. We were looking for people that wanted to be online but were unable to afford the cost, or unable to satisfy a credit reference check. It should not surprise then that many were distrusting of strangers or had lives that were either sufficiently chaotic or ‘under the radar’ to make participation in a longitudinal research project hazardous (cf. Emmel, Hughes, Greenhalgh, & Sales, 2007). Blinded by the computer scientists conception of digital exclusion as a primarily economic-technical issue, we were not sufficiently alert to it.

3.3.2. *Maintaining research independence*

The original research intentions of the PAWS project were as follows. Amongst the computer scientists, data collected on the performance of the network, and the demands placed upon it by Sharers and Citizens alike, would provide the means of addressing technical questions on the viability of the approach. For the sociologists, the project presented the opportunity to access a cohort of digitally excluded. We would study over several months the lived experience of those who bore this label of policy makers, as well as the subsequent impact that an Internet connection had on their day-to-day reality. It was envisaged that both team’s data would be used to support the analysis of the other.

The failure of the recruitment phase to garner enough users of the PAWS system greatly hindered both teams. For the sociologists at least, this did not necessarily have to be the case. There was certainly no escaping the extra fieldwork created by the problems described above, and our professional obligations to the project meant it was only right that we exhausted much of our time on making PAWS the success we hoped it would be. However, that we could not establish enough users of the system did not negate the value of the participants we had tracked down. Consider, the recruitment shortage was ultimately not of Sharers or Citizens, but of *pairs*. We still had access to both the digitally-included and

-excluded, and so the potential for a study of digital exclusion, minus the technological panacea, was still possible. We were too invested in the project as envisaged to recognise this opportunity until it was too late. Only with hindsight can we say with certainty that this was a mistake – at the time there was always reason to believe that the adjustments to our approach we made throughout the fieldwork might pay off – however the truth is we did not stop to weigh up these options when we might have. Instead we continued to cut into our planned research time doing recruitment work. Where we did find time to conduct research, too much of it concerned questions the project would be ultimately be unable to answer.

4. Conclusion

In this paper we have presented an account of the fieldwork implications of ‘in the wild’ interdisciplinary collaboration between computer science and sociology. In doing so we draw attention to a new context for social science research, as well as the trials involved the *doing* of such collaboration. There are unquestionably exciting, and well-resourced, opportunities emerging for social scientists to collaborate with technologists. To study interdisciplinary collaboration in the *doing* is to direct attention to the moments where the tensions and contradictions inevitable in interdisciplinary work become unavoidable (Massey et al., 2006). We have identified three particular challenges which were costly during the PAWS fieldwork, which we labelled ‘problems of time’, ‘digital plumbing’, and ‘going native’. In this concluding section we draw on our experiences to put forward some ideas on how these challenges might be met.

4.1. Problems of time

The work described here is difficult, but more importantly, it is *slow*. In hindsight, as sociologists we approached PAWS with a false sense of security, derived from the fact that ethnography within CS is nothing new. As we have argued here however, PAWS *was* new, markedly different from the settings and inquiries of previous ethnographic work in CS.

The development of Mode 2 research (Gibbons et al., 1994) changes the demands on this work. The applied nature of PAWS, and to the ‘grand challenge’ of socio-technical exclusion no less, drove the need to engage with both experimental technologies and a marginalised community. These two elements in combination shaped much of what is described above. They determined that ‘quick and dirty’ would not suffice. The social distance between researcher and potential participant; the characteristics of the setting; the size of the sample and the limitations on the population it was drawn from; the questions the social study was set to: all demanded an extended programme of fieldwork. Ironically, this new form of research calls for a return to traditional notions of ethnography.

The cadence of this work is particularly jarring when juxtaposed with that of CS, a discipline which prides itself on the pace which with it moves. In this world of iterative, ‘agile’ development, of ‘move fast and break things’,⁴ it is vital for sociologists and computer scientists alike to recognise both the investment of time required to access settings such as PAWS, and to maintain a presence within it. Intervening is delicate work: the ethnographer is a guest of the setting, they cannot afford to break *anything*. As such fieldwork entails the deployment of a technology, the timescales of CS and ethnography become intertwined. From the start of deployment, studies in settings such as PAWS’ can be no more agile than an ocean liner, slow to start and no quicker to stop. Whilst sociologists must recognise that computer scientists ‘can only build imperfect systems’ (Sommerville et al., 1993), and that technical issues will always emerge during deployment, computer scientists must be ready to adjust the rhythms of development they are used to. This means appreciating that participants’ willingness to take part is provisional on the robustness of the technology that we are asking them to incorporate into their practices, and that second chances cannot be assumed.

Recognition of this problem, by both technical and social science teams, is the first step to solving it. It is sensible in any project to include slack in the project timeline where possible, but particularly

so where one disciplinary team is reliant on another. Beyond this, a pilot deployment of the technology offers a practical measure for establishing some synchronicity between the rhythms of ethnography and CS. Whilst this would not have solved intractable issues such as the ever-changing infrastructural base on which PAWS rested, it would have identified some issues earlier for both teams, as well as providing interim targets for the technical work to aim up, rather than a single all-or-nothing deadline. There are also questions here for funders, about the time frames required for the forms of inquiry they are promoting. The 'research in the wild' programme which funded PAWS was limited to 18 month projects. The authors' personal conversations with members of similar projects, including one from the same funding call, suggest our experience of insufficient time to access the setting was not unique.

4.2. Digital plumbing

These collaborations need all parties to be sensitive towards the work which falls between the disciplinary gaps. This is the work of 'digital plumbing' (Tolmie et al., 2010), the work of installing and maintaining the study's technologies in the social worlds of the setting. In PAWS, the fieldwork was entirely the domain of the sociologists. The result of this was that they often found themselves facing technical problems they were poorly equipped to deal with. At the same time, the computer scientists' distance from research site limited their ability to address the challenges discussed here. Our recommendation then is that efforts are made to ensure computer scientists are formally included amongst the fieldwork team. A technical team member should always accompany visits where digital plumbing is required, so that the social scientist(s) can focus their attention on the interactional demands of the humans within the setting. Such a role would help to underscore the fact that technical involvement in the project does not end at the moment of deployment, as well as ensure the necessary time was allocated in the research plan. The wild's capacity to find imperfect systems wanting, and to present a moving target of shifting operating systems, router protocols etcetera, means that technical teams need to be engaged throughout deployment.

Collaborators must also remain sensitive to the *knowledge* which falls between the disciplinary gaps. Wi-Fi range was a key feature of the PAWS model, but it was the fieldwork team (the sociologists) who would grapple with it, having not recognised that this was not a technical matter the CS team were proficient in. Indeed, as is the nature of experimental work, *real world* Wi-Fi range beyond the building it is intended for appears a matter very few anywhere are proficient in.

4.3. Going native

Doing interdisciplinarity means stepping outside traditional discipline boundaries and making a commitment to meaningful engagement with what may be very different logics of enquiry (Barry et al., 2008). There is though a balancing act to be done here. Social scientists must strive to maintain a critical appraisal of the technological programme and its conception of the setting. Perhaps too enamoured by the laudable goals of PAWS, the sociologists did not always do this, becoming too close to the project's 'technical boosterism' (Savage, 2015, p. 298). As a result, we mischaracterised important elements of the setting, underestimating certain risks as a result. Furthermore we did not adapt quick enough to a new focus for our research, when it started to become apparent that the original goal of widespread deployment of the technology was in trouble. Our recommendation here would be to always have a 'Plan B'. Technology deployments in the wild are inherently risky, but the social scientist's fortunes do not have to be tied to it. Access to the setting brings its own opportunities independent of the technical goals. This Plan B should be established early on, and designed in such a way that it can complement initial field studies, which will likely take place before a need to change tack becomes apparent.

In closing, we address a final question. Given the demands on the research process detailed here, and PAWS' ultimate failure to meet its fieldwork goals, one might well ask 'why bother?'. Why take on such a daunting challenge?

To such a voice we would say *social science cannot afford not to*. The contemporary funding environment increasingly demands applied research, which demonstrates direct socio-economic benefits. The funding priorities in the UK suggest that policy makers see technologies, particularly digital ones, as a primary means of achieving this. As Savage (2010, p. 249) remarks:

If there is a future for the social sciences, it consists in forming intellectual and technical alliances with ways of knowing – from humanities, sciences, and informational systems – with which they are currently weakly affiliated.

However, there are not just pragmatic reasons for this. If social science is to remain relevant, it must adapt to a world in which human life is increasingly interweaved with technical systems. PAWS' research questions were intended to engage with just such a world, but due to the difficulties of recruitment it failed to satisfactorily answer them. Its success instead was in demonstrating the practical work to be solved first. To do such work – and it does *need* to be done – requires a research team forewarned. We hope the arguments presented here offer some counsel to that end.

Notes

1. For an example of this kind of work, see the workshop report *Energy Social Scientists in a Multidisciplinary Setting: Opportunities and Challenges* (TEDDINET, 2015).
2. It is unquestionably problematic referring to a marginalised community as 'the wild'. We do so as this is the language of the paradigm through which this work was funded (EPSRC, 2012) – 'wild' here meaning anywhere outside the traditional settings and demographics of technology-related academic research. This language is revealing of the describer rather than the described.
3. The 'PAWS box' was an off-the-shelf router running custom software that the CS team created. It generated a 'PAWS' Wi-Fi signal that Citizens could connect to.
4. 'Move fast and break things' is famously a mantra amongst Facebook developers.

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